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XXVIII. *An Account of the Impressions of Plants on the Slates of Coals : In a Letter to the Right Honourable George Earl of Macclesfield, President of the R. S. from Mr. Emanuel Mendes da Costa, F. R. S.*

My Lord,

Read April 28, 1757. **I** Have the honour to address this letter to your Lordship, in order to be communicated to the Royal Society, if your Lordship deems it worthy the attention of that learned and illustrious assembly.

The impressions of various kinds of plants are frequently, I might say always, found in some of the strata lying over coal ; but more particularly in a stratum of earthy flat, which, in my History of Fossils, page 168. Species IV. I have synonymed *Schistus terrestris niger carbonarius*, and which always lies immediately upon the coal-stratum, not only in the coal-pits of this kingdom, but of many other parts of Europe, *e. g.* France, Saxony, Bohemia, Silesia, &c.

Most of these impressions, my Lord, are of the *herbæ capillares et affines*, the gramineous, and the reed tribes : but, however, among them many rare and beautiful impressions undoubtedly of vegetable origin, and impressed by plants hitherto unknown to botanists, are not unfrequently met with.

Besides these, my Lord, found over coal-pits, there are likewise found in some parts of this kingdom, as at Robinhood's-bay in Yorkshire, Coalbrookdale
in

Fig. 2.

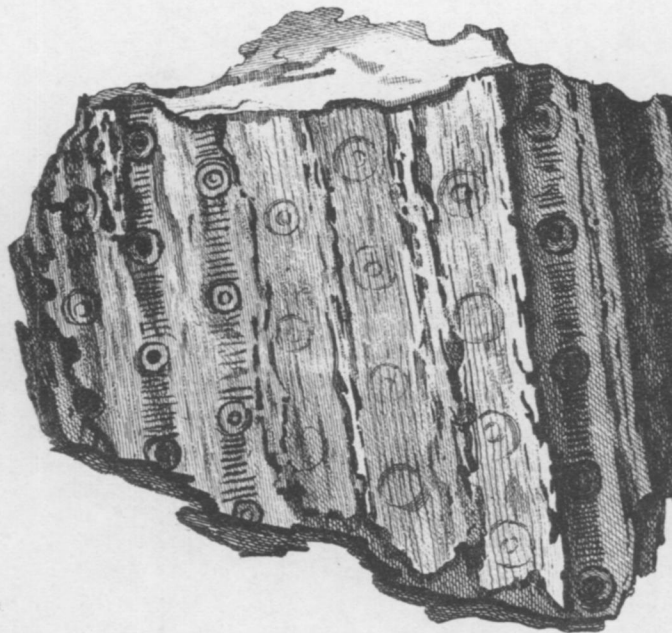


Fig. 3.

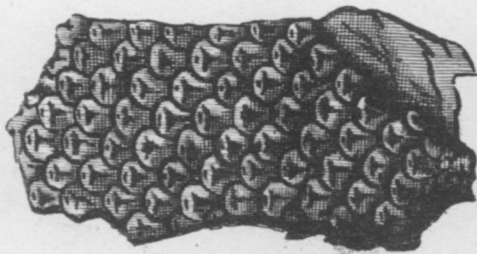


Fig. 7.

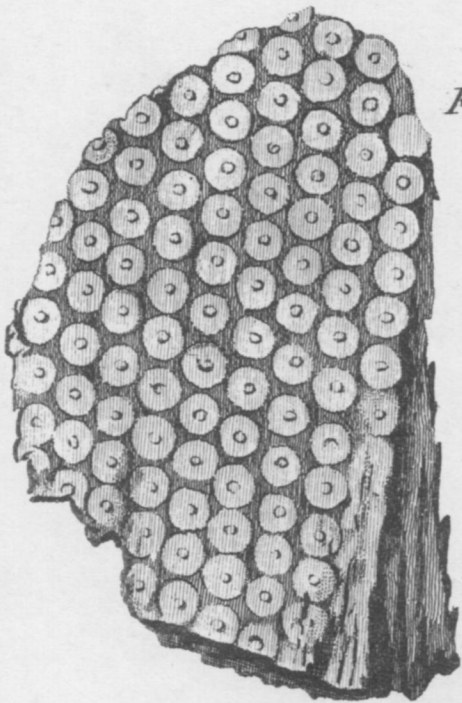


Fig. 6.

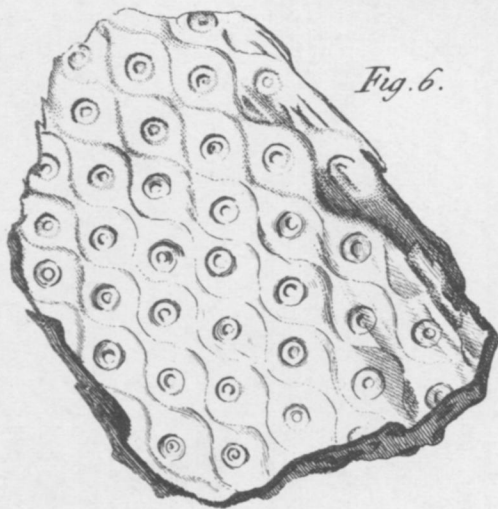


Fig. 1.

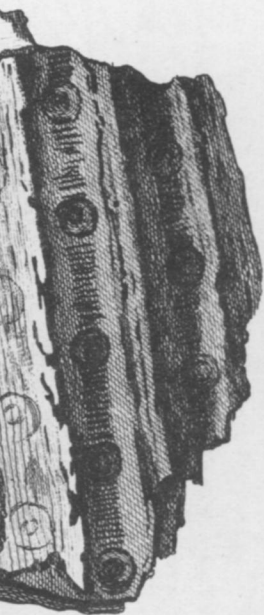


Fig. 4.



Fig. 6.



Fig. 5.



in Shropshire, &c. many curious impressions of the fern tribe in regular nodules of iron-stone; and, in the latter place, not only impressions of plants, but even the cones or iuli of some kinds of trees are met with, very perfect and fair, and curiously imbedded in masses of iron-stone.

The most part of the impressions of ferns, grasses, &c. are easily recognizable, they so minutely tally to the plants they represent. Others indeed, tho' they do not exactly answer any known species, yet have characters so distinctly expressed, that they are easily arranged under their respective genera (1). Therefore I shall not trouble your Lordship with any further remarks on all such, but shall only touch on those elegant and extraordinary impressions, probably of unknown vegetables, above-mentioned: for that they are the parts and impressions of vegetables, I think clearly evinced, if we attentively and with a philosophical mind consider them, and reflect on the various circumstances, which attend them in the places, where they now lie buried.

I have therefore the honour, my Lord, to exhibit the drawings of seven such extraordinary impressions, and the fossiles themselves, for your Lordship's and this learned body's inspection (See TAB. V.). The impression figured N^o. 1. is from Mr. Mytton's collieries at Drilt, near Oswestry, in Shropshire; as are also those figured N^o. 2, 4, and 7: they are found

(1) The celebrated Dr. Scheuchzer has arranged the fossile plants botanically, by Tournefort's system, in his folio work, intitled, *Herbarium Diluvianum*; and Dr. Woodward's fossile plants, Catalogue B, he informs us, were botanically considered and arranged by those famous botanists Dr. Plukenet, and Mess. Doody, Buddle, and Stenclirra.

sometimes two feet in length, and are generally covered with a thin crust of coal. The specimina Dr. Woodward exhibits, Catalogue B, pages 106, 107. specimina *q.* 22. and *q.* 32. are analogous to this, tho' not exactly the same. The Doctor's fossiles were from Haigh in Lancashire; and he imagines the impressions to be made by vegetables of the fir kind. Volckman also, in his *Silesia subterranea*, tab. 22. fig. 2. figures a branch with a rhomboidal work on it, and with three long narrow leaves, which seems akin to this impression.

N^o. 2. seems of the reed tribe: the knobs placed in rows, which are like the vesicles on the *quercus marina*, and some other *algæ*, are very remarkable. Woodward, Catalogue B. page 9. specimen *a.* 1. exhibits an impression akin to this, which he imagines to be of the fern kind.

N^o. 3. from a coal-pit in Yorkshire. I cannot but think this impression is owing to somewhat of the fir kind. Dr. Woodward, who exhibits such a like impression, Catalogue B. p. 16. specimen *a.* 108. imagines the same: his words are, "The impression is much like what might be made by the branches of the common fir, after the leaves are fallen or stript off."

N^o. 4. seems to be of the same kind as N^o. 2.

N^o. 5. This extraordinary impression is from Mostyn-colliery in Flintshire. It is a little obscured; but, when attentively viewed, exhibits a reticular impression, the meshes whereof are rhomboidal hollows, and the sides of the rhombs, or the net-work, are raised, or in relief.

N^o. 6. is from Newcastle. Volckman, *ibid.* part 3. tab. 4. fig. 9. seems to be of this kind.

N^o. 7.

N^o. 7. The same author, Volckman, figures a somewhat-like impression, *ibid.* fig. 5.

Only these seven extraordinary impressions I have presumed, my Lord, to treat of at this present time; but I have many more in my cabinet equally curious, some few of which I here exhibit to the Society, without taking any further notice of them: only I shall add, that many extraordinary impressions occur in Woodward's and other collections, and many are iconed in authors, worthy the attention of the curious.

These impressions, my Lord, are not only met with in small pieces; but large evident branches, some feet in length, have been found. I have, in the collieries of Derbyshire, frequently traced branches with (what seemed to me) long narrow leaves proceeding from them, and parts of other vegetables, above a foot's length: but the hardness of the substance they are immersed in renders it impossible to get them out without breaking them to pieces (2).

As these remains of vegetables are very extraordinary, I would recommend to the curious in botany to take notice of them, as an *Appendix Plantarum adhuc incognitarum*. For my part, I am so very little skilled in botany, that I hardly presume to offer my opinion; which is, that they are impressions and parts of species of the firs and pines, of the tithymals, the cereus's, and other arboresecent plants, and of large reeds; for some of the said

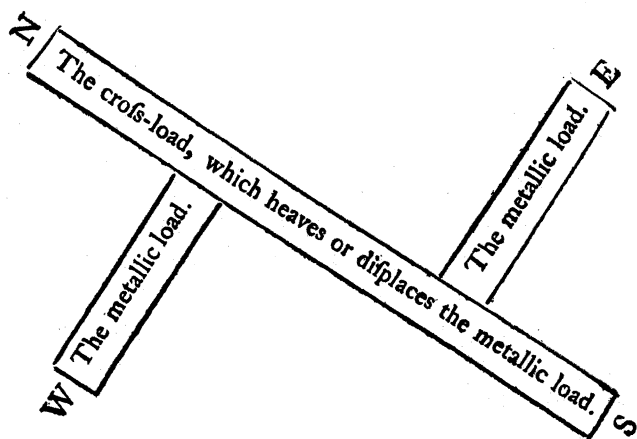
(2) Woodward, Catalogue B. p. 104. specimen *g. r.* was of 6 1-half feet in length; and Catalogue D. p. 60. specimen *b. 38.* was a yard long; *et alibi passim*. In the collieries at Swanvich in Derbyshire, in 1752. a plant of the cane kind was found 14 feet long: it ended in a point at one end, and at the root in a large knob, and in the middle measured nine inches about.

kind are embellished with ribbed, studded, and reticulated works; *e. g.* the Hercules' club, or *rubi facie senticosa planta Lobelii*, described by Dr. Grew, *Museum Reg. Soc.* p. 221. the *cerei*, &c.

I further exhibit to the Society some few specimina of iron-stones with cones or iuli imbedded in them. These, my Lord, are from veins of ball iron-stone, in the lands of Lord Gower, at Okenyate, a village on the Roman road of Watling-street; and from the iron-works at Coalbrookdale in Shropshire. The cones are frequently met with in fragments, but rarely so intire; and are never found but in the strata of iron-stone. I have added to these a figured fossil body, much like a cone, found sometimes in our chalk-pits in England, but chiefly in the pits at Cherry-Hinton in Cambridgeshire. Dr. Woodward, *Catalogue B.* p. 22. specimen *b. 72.* calls them cones seeming to be of the *larix*; and imagines they were not come to ripeness or maturity. They certainly have some resemblance to cones, tho' I much doubt them to be so; but they most exactly resemble the roots of the *cyperus rotundus vulgaris* of botanists.

I shall finish this paper, my Lord, by acquainting your Lordship and the Society, that I firmly believe these bodies to be of the vegetable origin, buried in the strata of the earth at the time of the universal deluge recorded by Moses. It is, I must confess, with regret, that I find there are some, who reject the burial of these bodies at that fatal catastrophe, but substitute partial deluges to account for it. Did those gentlemen consider, or maturely weigh, the many remarkable and strong evidences of an universal deluge, every-where obvious in the bowels of the earth, they certainly would abandon their imaginary system:

system : for, my Lord, it is not only the immense quantities of marine remains, dispersed in all terrestrial strata, which are to be considered (that circumstance alone might give some reasoning to their system of partial deluges), but the following more weighty circumstances are likewise to be added and flung into the scale. 1°. The heavings, displacings, trappings, and breaks of the metallic veins, and the loads of rubble, met with at vast depths, and where no marine remains were ever found ; and such heavings, &c. are not rare in metallic or mineral works : of which, to give your Lordship an idea, I have presumed to sketch the following plan of such a phenomenon.



These cross-loads are not unfrequent in the mines on North Downs, near Redruth, in Cornwall. Wheal-Widden copper-work there, in 1750, was about 60 fathom deep. The load was 20 feet over ; and has many cross-loads two or three feet over, which sometimes heave the metallic load from one to five or six fathom. These cross-loads are generally filled with fragments of stone, minerals, and other rubble.

2 . If these effects proceed from local deluges, recedings of the sea, gulphs atterrated, &c. we should then indeed find marine remains : but how will that account for the vast quantity of remains of terrestrial vegetables and animals, equally met with, and in like manner as the marine remains, in the bowels of the earth ? And, 3°. Were local or partial deluges the cause, we should then find only the animals and plants of the climates or places, where such deluges have happened ; whereas in these fossile remains it is quite the contrary : the remains of those plants and animals, we know, are of animals and plants, the inhabitants of the most remote climes from those, where they now lie buried ; *e.g.* the rhinoceros-bones, in the cave called Baumans-hole, in the Hartz Forest in Germany ; the strange bones in the Antra Draconum in Hungary ; the horns of the moose-deer, and other prodigious horns, and elephants bones, found in England, Ireland, Germany, Sibiria, and even America, &c. of vegetables, parts of the arbor tristis in France ; bamboo's, or great Indian reeds, frequent in England ; with numbers of other such examples. And of those remains even of the marine shells, yet unknown to us, all appear exotic to the climes where they now lie deposited ; *e.g.* the cliffs at Harwich in Essex abound with a species of *buccinum heterostrophum*, and other shells, never yet discovered in the adjacent waters. The *ammonitæ* of so many species, and the innumerable variety of *conchæ anomitæ*, with which this island abounds, are yet unknown to be inhabitants of our seas, and appear exotic to this climate. Therefore, my Lord, I reasonably conclude partial or local deluges could never have produced

produced such effects. However, unprejudiced to any opinion, if the learned, who favour the system of partial deluges, will either confute these my assertions, or give solid reasons for the facts alleged to be producible by local deluges, atterrations, &c. I will joyfully embrace the truth : but till then, my Lord, I would recommend to those systematical gentlemen, not to pervert that excellent maxim of the great Lord Bacon, and, instead of *Non fingendum neque excogitandum, sed inveniendum quid natura faciat, aut ferat*, not to corrupt it into *fingendum atque excogitandum, non inveniendum quid natura faciat, aut ferat*.

I am, with great submission and respect,

MY LORD,

Your Lordship's

Most devoted,

London, 27 April,
1757.

and most obliged,

humble Servant,

Emanuel Mendes da Costa.